
Space Weather Forecast

Issued on Tuesday, 28 November 2023 at 13:25 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: M-flares likely (R1-R2 Blackouts). Chance of G1 Minor Storms day 3-4 (30 Nov-01 Dec) due to coronal mass ejection arrivals

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low, with a couple of moderately sized common flares observed. The largest was at 27/1852 UTC from the combined effect of the eruption of a filament (line of material held together by the Sun's magnetic field) from the northeast disc and also a flare from the largest sunspot on the disc in the southeast quadrant. This is the most notable and largest of the eleven visible sunspot regions. This region is comprised of a compact cluster spots, while a couple of newly emerged spots near its larger trailer spot has also resulted in a more complex magnetic structure developing. All other regions on the disc remain smaller and simpler, and either stable or showing signs of decay.

There are also a number of other filaments on the Earth-facing disc. Two of these erupted to produce coronal mass ejections (CMEs), the first as mentioned above, and the second with another common class flare peaking at 27/2340 UTC. The first produced a weak and slow, but CME, while the second produced a faster CME that was a little more off the Earth-Sun line. However both of these have been assessed as having potential Earth-directed components arriving on day 3 and 4 (30 Nov and 01 Dec).

Solar Wind / Geomagnetic Activity: Solar wind speeds have been slightly elevated, around 450-500km/s. Interplanetary Magnetic Field (IMF), was weak, with the north-south component also weak and variable in direction. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate with the likelihood of isolated Moderate flares (R1-R2 Blackout). These most likely from the larger region in the southeast, which also brings a slight chance of an isolated Strong-class flare (R3 Blackout).

Solar Winds / Geomagnetic Activity: There are three CMEs that may impact Earth. The first from a filament eruption on 27 Nov is forecast to arrive early on day 3 (30 Nov) giving a glancing impact. The CME from the 27/2340 UTC filament eruption is forecast to largely miss, but with the potential for glancing impacts later on day 3 (30 Nov), however this may also combine with the earlier arrival to give a stronger impact. The third arrival has higher confidence for impact Earth, but is slower and weaker, likely arriving late on day 4 (01 Dec). Aside from the CMEs, current slightly elevated solar wind is expected to soon ease to background day 1-2 (28-29 Nov). Mainly Quiet geomagnetic activity is forecast with a chance of isolated Unsettled spells. Any CME arrivals are likely to bring a spell of Active to G1-Minor Storms, with a slight chance of G2 Moderate Storm intervals. These most likely if a combined arrival occurs day 3 (30 Nov). This will bring the potential for visible aurora as far south as northern Scotland, although this is low confidence.

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Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is likely to stay at background, but there is the potential for an increase to be observed if any large flares or filament eruptions occur. This brings a slight chance of approaching, and perhaps exceeding, the S1 Minor Radiation Storm levels.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	10	40	30
Strong	G3	No	1	2	5	5
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	60	60	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)